# Outbreaks of Enteric Infections Caused by Multiple Pathogens Associated With Calves at a Farm Day Camp

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**Background:** Transmission of enteric pathogens at venues where the public contacts farm animals is a growing problem, particularly among children. In 2000 and again in 2001, enteric illness outbreaks caused by multiple pathogens occurred at a farm day camp for children in Minnesota.

**Methods:** Camp attendees were interviewed about illness history and potential exposures each year. Stool samples from children and calves at the camp were tested for enteric pathogens.

**Results:** Eighty-four illnesses were documented among camp attendees in the 2 outbreaks; laboratory-confirmed infections included *Cryptosporidium parvum* (17 cases), *Escherichia coli* O157:H7 (4), non-O157 Shiga toxin-producing *E. coli* (STEC) (7) and *Salmonella enterica* serotype Typhimurium and *Campylobacter jejuni* (1 each). Kindergarten–fourth grade children provided 1-on-1 care for a bottle-fed calf. Sixty of 83 calves tested carried at least 1 pathogen, including *Giardia* spp. (26 calves), *C. parvum* (25), non-O157 STEC (17), *Campylobacter* spp. (11), 3 serotypes of *Salmonella enterica* (10) and *E. coli* O157:H7 (2). Risk factors among children included caring for an ill calf and getting visible manure on their hands. Always washing hands with soap after touching a calf and washing hands before going home were protective. Prevention measures implemented in 2000 failed to prevent the second outbreak.

**Conclusions:** Calves were the reservoir of multiple enteric pathogens for children at a farm day camp. Health care providers should consider numerous zoonotic pathogens in patients presenting with gastroenteritis after contact with cattle. Public health officials should help venue operators prospectively implement published guidelines to prevent zoonotic disease transmission.

**Key Words:** *Cryptosporidium*, Shiga toxin-producing *Escherichia coli,* outbreak, cattle, farm day camp

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Transmission of zoonotic enteric pathogens at facilities where the public has direct contact with farm animals appears to be a growing public health threat.[1–12] Outbreaks at these facilities have primarily involved children and have been caused by *Escherichia coli* O157:H7 or *Cryptosporidium parvum*.[1–12] In the United States, the etiology in published accounts of enteric illness outbreaks at these facilities has been limited to *E. coli* O157:H7.[1,3,6] Worldwide, the cause of these outbreaks typically has been contact with cattle and/or small ruminants (ie, goats and sheep), which are well-established reservoirs for these pathogens.

We describe here 2 outbreaks that occurred in consecutive years at the same farm day camp for children. These outbreaks were remarkable for 3 reasons: (1) multiple enteric pathogens, including *C. parvum*, were recovered from human case-patients and from calves at the camp during both outbreaks; (2) non-O157:H7 Shiga toxin-producing *E. coli* (STEC) played a prominent role in the outbreaks, and indistinguishable molecular subtypes of non-O157:H7 STEC were recovered from children and calves; (3) extensive prevention measures were implemented during the first outbreak and appeared to interrupt transmission; however, these prevention measures failed to prevent a similar outbreak at the camp the following year. Our outbreak investigations demonstrate the need for physician awareness of numerous zoonotic enteric pathogens and provide insight into critical efforts needed to prevent transmission of enteric pathogens at farm animal facilities.

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## MATERIALS AND METHODS

### Outbreak 1, 2000

*Background.* On July 10, 2000, the Minnesota Department of Health (MDH) received a call from a parent reporting children with gastrointestinal illness who had attended a farm day camp. That same day, a child with *C. parvum* diarrhea identified through routine disease surveillance at MDH reported attending the same day camp.

The farm day camp was sponsored by a university and held on campus. The camp was designed to introduce children from kindergarten through eighth grade to farm animals and plants with fun, hands-on activities. Children were familiarized with a variety of farm animals. There were 8 sessions scheduled throughout the summer. Each session lasted 1 week (Monday through Friday), and ~50 different children attended each session.

*Epidemiologic Investigation.* Children who attended the camp and their parents were interviewed by telephone about illness history, animal contact and food consumption at the camp. After the outbreak was confirmed, more detailed questions on hygiene were added. A case was defined as a child who attended the camp and subsequently developed gastrointestinal illness (diarrhea or vomiting) within 14 days after the last day of camp. Diarrhea was defined as 3 or more loose stools in a 24-hour period. Children who reported gastrointestinal symptoms but did not meet the case definition were excluded from all analyses. Stool samples were collected for bacterial and parasitic pathogen testing at MDH; results for case-patients who sought medical attention were obtained from their health care providers.

The investigators conducted a site investigation of the camp on July 11 and collected fecal samples from selected calves. Two subsequent visits were made to evaluate interventions and collect additional calf fecal samples. Calf sampling was focused on calves associated with the initial reports of human illness; in addition, 33% of the remaining calves were randomly sampled.

*Laboratory Investigation.* Human and animal fecal samples were placed in Cary-Blair transport medium and cultured within 48 hours for *E. coli* O157:H7, *Salmonella enterica* and *Campylobacter* spp. using routine methods.[13] In addition, immunomagnetic separation and addition of cefixime and tellurite to sorbitol MacConkey agar was used to facilitate detection of *E. coli* O157:H7. Isolates of *E. coli* O157:H7 were confirmed serologically and tested for Shiga toxin genes at the MDH Public Health Laboratory. Shiga toxin genes ($stx_1$ and $stx_2$) were detected in sweeps of DNA from sorbitol MacConkey plates by polymerase chain reaction with established primers.[14] The presence of Shiga toxin genes was confirmed in isolated *E. coli* colonies at MDH. Non-O157 STEC isolates were forwarded to the Centers for Disease Control and Prevention for serotyping. Isolates of *E. coli* O157:H7, non-O157 STEC and *Salmonella enterica* were subtyped by pulsed-field gel electrophoresis (PFGE).[15]

Fecal samples were tested for *Giardia* and *Cryptosporidium* through routine ova and parasite examination (with carbol-fuchsin staining for *Cryptosporidium*)[13] and through a direct immunofluorescent assay (Merifluor; Meridian Bioscience Inc., Cincinnati, OH). Genotyping of *Cryptosporidium* was accomplished by polymerase chain reaction of the dihydrofolate reductase gene followed by restriction fragment length polymorphism analysis (PCR-RFLP).[16]

### Outbreak 2, 2001

*Epidemiologic and Laboratory Investigation.* Epidemiologic and laboratory methods used in 2001 were the same as those used in 2000, except that all calves at the camp were sampled in 2001.

### Statistical Analyses

Univariate odds ratios and corresponding 95% confidence intervals were determined using Epi-Info software version 6.04 (Centers for Disease Control and Prevention). To identify exposures that were independently associated with illness, adjusted odds ratios and corresponding 95% confidence intervals were determined with the use of exact conditional logistic regression with a forward, stepwise approach (SAS System for Windows, release 8.10; SAS Institute). All variables associated with illness at $P < 0.05$ were entered into the regression model each year.

## RESULTS

### Outbreak 1, 2000

The initial visit to the camp revealed that children had opportunities for direct contact with a variety of animals, including calves, pigs, sheep, horses and chickens. However, the primary attraction of the camp for young children was that each child was directly responsible for 1-on-1 care of a calf. Children in kindergarten through fourth grades cared for young (<2 months old), bottle-fed calves held individually in small, contiguous pens. Care included bottle-feeding the calf, grooming the calf and cleaning manure from the pen; children routinely entered the pens of their calves. Care was provided while wearing street clothes; no protective clothing or boots were worn. Ill calves were housed in the same barn as those calves cared for by the children. Children in fifth through eighth grades cared for weaned sheep. Handwashing facilities were not present at the calf barn; the closest running water was ~70 meters away in an adjacent building. Alcohol-based sanitizers were available from each student counselor who supervised 6–8 children.

Of 190 camp attendees interviewed, 59 (31%) met the case definition. Eleven (6%) additional camp attendees reported illness that did not meet the case definition (and were thus excluded from analyses). Twenty-six of 72 (36%) boys

and 33 of 107 (31%) girls who were interviewed met the case definition. The 59 cases included 13 kindergarteners, 13 first graders, 12 second graders, 14 third graders, 6 fourth graders and 1 fifth grader. Fifty-eight of 155 (37%) interviewed children in kindergarten through fourth grade were cases, versus 1 of 24 (4%) children in fifth through eighth grades (odds ratio, 13.8; 95% confidence interval, 2.1–576.1; $P = 0.001$).

Fifty-two (88%) cases reported diarrhea, 47 (80%) reported abdominal cramps, 29 (49%) reported vomiting, 17 (29%) reported fever and 4 (7%) reported bloody stools. The median duration of illness among cases who had recovered by the time of interview (n = 40) was 6 days (range, 1–25 days). One case was hospitalized for 6 days. Dates of illness onset ranged from June 14 to July 31 (Fig. 1). The following proportion of children who attended the camp and were interviewed met the case definition: 19 of 29 (66%) in session 1 (June 12–16); 23 of 32 (72%) in session 2 (June 19–23); 8 of 45 (18%) in session 3 (June 26–30); 7 of 45 (16%) in session 4 (July 10–14); 1 of 27 (4%) in session 5 (July 17–21); and 1 of 1 (100%) in session 6 (July 24–28). For the 55 cases with a known onset date, the median onset of illness was 2 days after the last day in their 5-day camp session (range, −3–13 days). Twelve (22%) cases had illness onset during the dates of their camp session, and 39 (71%) had onset during the first 7 days after camp had ended.

Stool samples from camp attendees were positive for a variety of pathogens, but primarily *C. parvum* (Table 1). Non-O157 STEC was isolated from 2 cases; STEC isolates were serotyped as O111:H8 and O111:nonmotile. However, both isolates were indistinguishable by PFGE. Both isolates were positive for $stx_1$. Eight of the 13 positive camp attendees were still symptomatic when tested; the other 5 had been recovered for a median of 8 days at the time of stool specimen collection (range, 1–14 days). Secondary infections with *C. parvum* were identified in 2 siblings of camp attendees.

Stool samples from 23 of the ~60 bottle-fed calves at the camp were tested for enteric pathogens. At least 1 pathogen was recovered from 20 of the 23 calves, and multiple pathogens were recovered from 10 calves (Table 1). Shiga toxin genes ($stx_2$) were detected in samples from 2 calves, but individual *E. coli* colonies could not be isolated for serotyping.

Because only 1 child in fifth through eighth grades reported illness, evaluation of potential risk factors focused on children in kindergarten through fourth grade (who cared for young, bottle-fed calves). The only identified risk factor for illness was taking care of an ill calf (Table 2). Always washing hands with soap after touching a calf versus never, sometimes or most of the time was protective against illness, as was washing hands before going home for the day (Table 2).

After recognition of the outbreak, several prevention measures were implemented during the remaining sessions of the 2000 camp. Camp coordinators were instructed to remove all ill calves from the calf barn. Portable handwashing stations were added outside the calf barn. Counselors were instructed to emphasize and supervise children's handwashing. Parents were provided written information on the inherent risks associated with livestock contact, and the importance of handwashing. Camp coordinators were provided published recommendations for disease prevention for farm

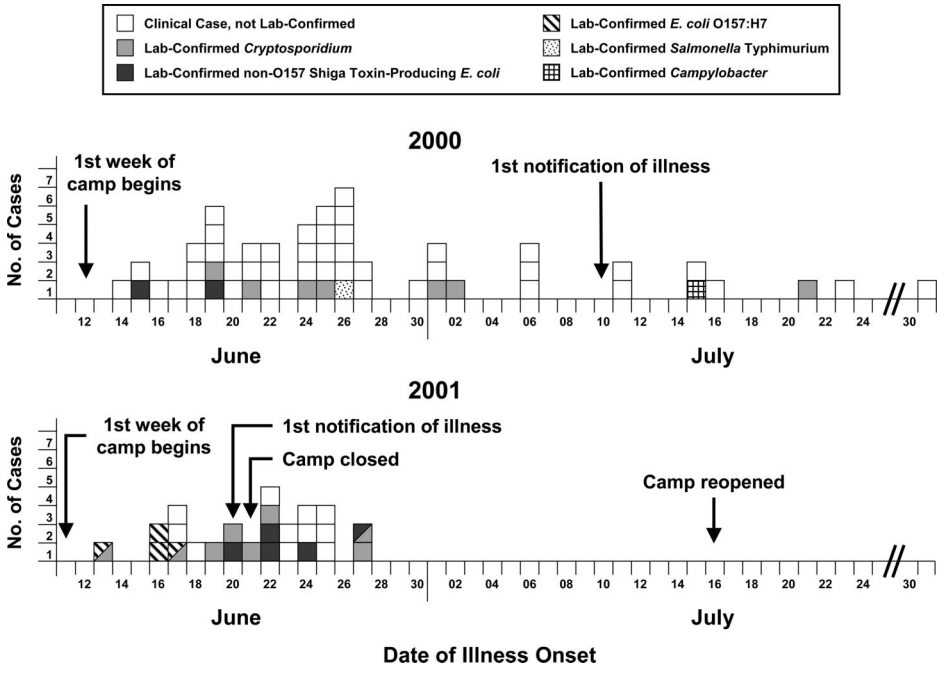


**FIGURE 1.** Epidemic curve of illness onsets for children during 2 outbreaks at a farm day camp, 2000 and 2001. For the 2000 outbreak, exact onsets were unknown for 4 cases. Of these 4 cases, 2 unconfirmed cases had onset during the week of June 18, 1 confirmed *C. parvum* case had a stool specimen collection date of June 30 and 1 confirmed *C. parvum* case had a stool specimen collection date of July 24.

**TABLE 1.** Laboratory-Confirmed Infections in Calves and Child Camp Attendees Tested During 2 Outbreaks at a Farm Day Camp, 2000 and 2001

| | 2000 Outbreak | | 2001 Outbreak | |
|---|---|---|---|---|
| | No. of Positive Calves of 23 Tested | No. of Positive Children of 13 Tested | No. of Positive Calves of 60 Tested | No. of Positive Children of 14 Tested |
| Pathogen | | | | |
| *Cryptosporidium parvum* | 7 (30)* | 9 (60) | 18 (30) | 8 (57) |
| *Campylobacter* spp. | 7 (30) | 1 (7) | 4 (7) | 0 (0) |
| *jejuni* | 3 (13) | 1 (7) | 4 (7) | 0 (0) |
| *coli* | 3 (13) | 0 (0) | 0 (0) | 0 (0) |
| *lari* | 1 (4) | 0 (0) | 0 (0) | 0 (0) |
| *Escherichia coli* O157:H7 | 0 (0) | 0 (0) | 2 (3) | 4 (29) |
| Non-O157 Shiga toxin-producing *E. coli* | 2 (9) | 2 (13) | 15 (25) | 5 (36) |
| *Salmonella enterica* | 2 (9) | 1 (7) | 8 (13) | 0 (0) |
| Typhimurium | 2 (9) | 1 (7) | 0 (0) | 0 (0) |
| Dublin | 0 (0) | 0 (0) | 6 (10) | 0 (0) |
| Muenster | 0 (0) | 0 (0) | 2 (3) | 0 (0) |
| *Giardia* spp. | 12 (52) | 0 (0) | 14 (23) | 0 (0) |
| At least 1 pathogen | 20 (87) | 13 (100) | 40 (67) | 14 (100) |
| >1 of above pathogens | 10 (43)† | 0 (0) | 16 (27)‡ | 3 (21)§ |

*Numbers in parentheses, percent.

†*C. parvum* and *Giardia* (2 calves); *C. jejuni* and *Giardia* (2); Shiga toxin-producing *E. coli* (STEC) and *Giardia* (1); *C. parvum* and *C. jejuni* (1); *C. lari* and *Giardia* (1); *C. coli* and *Giardia* (1); *C. coli, Salmonella* serotype Typhimurium, and *Giardia* (1); and *C. parvum, C. coli, Salmonella* serotype Typhimurium, and *Giardia* (1).

‡*C. parvum* and *Giardia* (4 calves); *C. parvum* and non-O157 STEC (3); *C. parvum* and *Salmonella* serotype Dublin (2); *Giardia* and non-O157 STEC (2); *C. jejuni* and non-O157 STEC (1); *E. coli* O157:H, *Salmonella* serotype Muenster, *C. parvum* and *Giardia* (1); *Salmonella* serotype Dublin, non-O157 STEC and *C. parvum* (1); non-O157 STEC, *C. parvum* and *Giardia* (1); and *C. jejuni* and *Giardia* (1).

§*C. parvum* and *E. coli* O157:H7 (2 children) and *C. parvum* and non-O157 STEC (1).

**TABLE 2.** Factors Associated With Illness Among Children Attending a Farm Day Camp, 2000 and 2001

| | Factor | No. With Factor/Total No. | | Univariate Analysis | | Multivariate Analysis | |
|---|---|---|---|---|---|---|---|
| | | Patients | Controls | Odds Ratio | *P* | Adjusted Odds Ratio | *P* |
| 2000 outbreak | Taking care of an ill calf | 22/48 (46)* | 15/92 (16)* | 4.3 (2.0–9.7)† | <0.001 | 20.6 (4.4–97.7)† | <0.001 |
| | Washing hands before going home for the day | 18/28 (64) | 50/57 (88) | 0.3 (0.08–0.8) | 0.01 | 0.07 (0.01–0.33) | <0.001 |
| | Always washing hands with soap after touching a calf (versus most of the time, sometimes or never) | 16/26 (62) | 47/55 (85) | 0.3 (0.09–0.8) | 0.02 | 0.06 (0.004–0.78) | 0.03 |
| 2001 outbreak | Getting visible manure on hands | 8/20 (40) | 5/44 (11) | 5.2 (1.4–20.0) | 0.02 | 4.7 (1.2–17.8) | 0.02 |
| | Always using alcohol-based sanitizing gels versus using them most of the time, sometimes or never | 2/19 (11) | 15/42 (36) | 0.2 (0.03–0.97) | 0.04 | Not significant | Not significant |

*Numbers in parentheses, percent.

†Numbers in parentheses, 95% confidence interval.

visitors.[17,18] Illnesses, which were already declining when the outbreak was detected, declined further during and after the fifth session (July 17–21) (Fig. 1).

## Outbreak 2, 2001

All interventions implemented in 2000 were kept in place for the farm day camp in 2001. In addition, before the camp began its 2001 season, camp coordinators were provided with recently published recommendations from the Centers for Disease Control and Prevention to reduce the risk of transmission of enteric pathogens from farm animals at public venues.[6] Nevertheless another outbreak occurred in 2001.

On June 20, 2001, MDH received a telephone call from a parent whose child was diagnosed with an *E. coli* O157:H7 infection by a local physician. The child had attended the farm day camp the previous week (the first week of camp).

MDH immediately initiated an investigation. After documenting multiple gastrointestinal illnesses among camp attendees, the camp was closed on June 21 (Fig. 1). The investigators, along with an environmental health specialist, conducted a site investigation of the camp. Fecal samples were collected from all available calves (n = 60).

Of 110 camp attendees interviewed, 25 (23%) met the case definition. Eleven (10%) additional camp attendees reported illness that did not meet the case definition (and were thus excluded from analyses). Nine of 36 (25%) boys and 16 of 63 (25%) girls who were interviewed met the case definition. The 25 cases included 2 kindergarteners, 2 first graders, 10 second graders, 5 third graders, 2 fourth graders, one fifth grader and 3 sixth graders. Of children who were interviewed, 12 of 44 (27%) from session 1 (June 11–15) and 13 of 55 (24%) from session 2 (June 18–22) met the case definition.

Twenty-three (92%) of the 25 cases reported diarrhea, 17 (68%) reported abdominal cramps, 12 (48%) reported vomiting, 8 (32%) reported fever and 4 (16%) reported bloody stools. The median duration of illness among cases who had recovered by the time of interview (n = 21) was 4 days (range, 1–14 days). Two cases were hospitalized, each for 4 days (one had *C. parvum* and the other had both *C. parvum* and *E. coli* O157:H7).

Dates of illness onset ranged from June 13 to 27 (Fig. 1). The median onset of illness for cases was 2 days after the last day in their 5-day camp session (range, −2–13 days). Five (20%) cases had illness onset during the dates of their camp session, and 19 (76%) had onset during the first 7 days after camp had ended.

Camp attendees were infected with a variety of pathogens, including *C. parvum*, *E. coli* O157:H7 and non-O157 STEC; 3 children were infected with a combination of these pathogens (Table 1). Thirteen of the 14 positive camp attendees were still symptomatic when tested; 1 positive attendee had been recovered for 3 days at the time of stool specimen collection. Secondary illnesses were identified in 6 family members of camp attendees, including 2 confirmed with *E. coli* O157:H7 and 1 with *C. parvum*; one of the secondary cases with *E. coli* O157:H7 was hospitalized for 3 days.

Fecal samples from 40 of the 60 calves were positive for at least 1 pathogen, and multiple pathogens were recovered from 16 calves (Table 1).

Three of the 4 human *E. coli* O157:H7 isolates were indistinguishable from one of the calf *E. coli* O157:H7 isolates by PFGE (subtype MN561) (Table 3). Of the 5 children with confirmed non-O157 STEC infections, serotyping indicated that 2 were infected with *E. coli* O111:nonmotile, 2 with *E. coli* O rough:H11 and 1 with an undefined serotype (Table 3). Fifteen calves had confirmed non-O157 STEC infections. Indistinguishable PFGE subtypes of non-O157 STEC shared between calves and children were documented for 2 serotypes or serotype complexes: *E. coli* O111:nonmotile (3 calves and 1 child with subtype ECM4); and *E. coli* O51:H11/O rough:H11 (6 calves and 2 children with subtype ECM1) (Table 3).

**TABLE 3.** Serotypes and PFGE Subtypes of Shiga Toxin-Producing *Escherichia coli* Isolated From Children and Calves During the 2001 Farm Day Camp Outbreak

| Serotype and PFGE Subtype* | No. of Children With Subtype | No. of Calves With Subtype |
|---|---|---|
| *E. coli* O157:H7 | | |
| MN561 | 3 | 1 |
| MN564 | 1 | 0 |
| MN563 | 0 | 1 |
| *E. coli* O111:nonmotile | | |
| ECM4 | 1 | 3 |
| ECM7 | 1 | 0 |
| *E. coli* O51:H11 | | |
| ECM1 | 0 | 4† |
| ECM1a | 0 | 1 |
| ECM2 | 0 | 1 |
| *E. coli* O rough:H11 | | |
| ECM1 | 2† | 2† |
| Undefined | 1 | 4 |

*PFGE subtypes (eg, MN561, ECM4) are indented under their respective serotypes.
†Six calf isolates, including 4 *E. coli* O51:H11 and 2 *E. coli* O rough:H11 isolates, and 2 *E. coli* O rough:H11 isolates from children all had an indistinguishable PFGE subtype pattern (designated ECM1). It was concluded that the *E. coli* O rough:H11 strains isolated from children and calves were *E. coli* O51:H11 for which the O51 antigen could not be identified.

From the 18 calves that were positive for *C. parvum*, 10 specimens were tested further by PCR-RFLP; all were confirmed as genotype 2. All 5 human *C. parvum* specimens tested further by PCR-RFLP were also confirmed as genotype 2.

Again risk factor analyses focused on children in kindergarten through fourth grade. The only exposure significantly associated with illness was visible manure on hands (Table 2). The use of an alcohol-based hand-sanitizing gel was protective against illness in the univariate analysis, but not in the multivariate analysis (Table 2). Use of the portable handwashing units after contact with a calf was reported by most of the cases (19 of 21, 90%) and controls (39 of 43, 91%).

The camp remained closed until more extensive interventions were implemented. The number of calves used was reduced, and only program supervisors were allowed to feed calves and enter calf pens. Camp attendees were required to wear short sleeved shirts to eliminate long sleeve contact with animals and better facilitate personal hygiene. Calves were kept outside the barn in pens that contained calf hutches; these pens were separated by at least 0.5 meter to minimize direct calf-to-calf contact.

A new handwashing station was engineered in the main camp building. Plumbing was run from a bathroom shower to the new handwashing station to provide a higher volume of warm running water. The station was comprised of a trough with 9 faucets (1 for the counselor and each child in a group of 8) and 1 spigot; the spigot was controlled by the counselor.

Camp counselors emphasized and supervised the campers' handwashing after they had contact with animals and before they ate meals. The environmental specialist trained the camp counselors on appropriate handwashing procedures. A hand washing video was incorporated into the camp curriculum. Finally a revised consent letter, which more explicitly explained the inherent risks of dealing with farm animals, was provided to parents. The camp reopened on July 16, and no further illnesses were identified.

## DISCUSSION

We documented enteric illness outbreaks caused by multiple pathogens in consecutive years at a farm day camp for children. Bottle-fed calves cared for by children were the source of multiple pathogens. Numerous outbreaks at similar facilities (eg, petting zoos, educational farms) have been reported in the United States and other countries in recent years, indicating a growing (or at least an increasingly recognized) public health problem.[1–12] These outbreaks have been attributed to single pathogens, usually either *E. coli* O157:H7 or *C. parvum*.[1–12] We believe that our report constitutes the first published polymicrobial enteric pathogen outbreaks associated with farm animal contact at a public facility anywhere, and the first published outbreaks of cryptosporidiosis associated with such a facility in the United States.

The polymicrobial nature of the farm day camp outbreaks was not surprising, as cattle are well-established reservoirs of *C. parvum*, *E. coli* O157:H7, non-O157 STEC, *Salmonella* Typhimurium and *Campylobacter jejuni*. Consequently health care providers and public health investigators must be vigilant for the possibility of numerous zoonotic pathogens in patients presenting with gastroenteritis after contact with cattle and/or their environment. In addition, they should not rely totally on laboratory diagnoses of individual patients when evaluating others in a group with similar exposures.

The high prevalence of many different pathogens in the calves at the camp was striking. During each year, the camp obtained all of its calves from multiple farms or at auctions immediately preceding camp and then congregated the calves. The congregation of young calves from multiple sources likely facilitated widespread transmission of enteric organisms among the calves before their use in the camp. Some of the calves developed clinical illness during the camp, and others that were not systemically ill had watery stools. Enteric illness among the calves likely was a major factor in transmission of pathogens to their children caretakers.

Non-O157 STEC played a prominent role in the outbreaks at the camp, particularly in 2001. Several studies or outbreak investigations have shown that non-O157 STEC isolates cause illness in the United States and other countries.[19–21] However, they likely represent an underrecognized cause of enteric illness because clinical laboratories rarely test specifically for this group of organisms.[19–21] Immunoassays for Shiga toxin are commercially available, and these tests could indicate the presence of non-O157 STEC. However, few laboratories use these tests, and of those that do, many may not isolate *E. coli* colonies to differentiate O157 from non-O157 STEC. In addition, non-O157 STEC isolates may not be serotyped.

Cattle are well-established reservoirs of *E. coli* O157 and non-O157 STEC.[19,20] In the 2001 farm day camp outbreak, indistinguishable PFGE subtypes were recovered from calves and children for 2 serotypes of non-O157 STEC. Cattle are suspected as a likely source of non-O157 STEC outbreaks, but direct implication of cattle as the source of non-O157 STEC in outbreaks rarely has been documented.[19,20] To our knowledge, the only such instance before our report was an outbreak of *E. coli* O26 infections in Austria caused by the consumption of unpasteurized milk; the same PFGE subtype of *E. coli* O26 was recovered from 2 children with hemolytic uremic syndrome and 1 of the cows that produced the milk.[22]

Even though *Giardia* was recovered from numerous calves during both camp outbreaks, no human cases of giardiasis were identified. This supports recent work from the United Kingdom suggesting that cattle may not be a significant reservoir of *Giardia* for humans.[23] However, this issue warrants further evaluation.

Prevention measures implemented during the 2000 outbreak appeared to interrupt the outbreak. Before the camp opened in 2001, camp coordinators were provided recently published guidelines to prevent the transmission of enteric pathogens from farm animals.[6] Yet another outbreak occurred as soon as the camp began in 2001. We suggest the following reasons for the failed prevention measures: (1) there were anecdotal reports that the portable handwashing stations were difficult to operate for small children and were often out of soap and/or paper towels (thus prompting children to dry their hands on their clothes, which were certainly susceptible to contamination during the camp); (2) the volume of water provided by the portable stations may not have been sufficient to accomplish adequate handwashing; (3) children performed all of their duties in street clothes, which in turn could have acted as fomites for subsequent transmission. It may be that transmission of enteric pathogens from calves to children is virtually impossible to prevent when children have such close, prolonged contact with young calves in this type of environment.

Facilities such as the farm day camp represent valuable learning experiences for children, and they are becoming increasingly popular with parents. However, because of the potential for serious, and sometimes fatal, infections with pathogens such as *E. coli* O157:H7, these facilities must be

operated under strict guidelines. We believe that existing recommendations[6,25] would be effective, if fully incorporated. It is important for public health officials to make sure that these recommendations are implemented at the appropriate venues. Simply passing on the guidelines to operators of these venues is not enough. Public health officials must be integrally involved with facility operators in prospective, comprehensive efforts to prevent zoonotic disease transmission in these settings.

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